1. BELYAKOVA, L. P. and PARISHKURO, N. S.

2. USSR (600)

4. Alfalfa

7. Role of alfalfa of various ages in increasing the fertility of the soils in the irrigated areas of the Vakhsh Valley. Soob.TFAN SSSR No. 3, 1951.

9. Monthly List of Russian Accessions, Library of Congress, March 1953. Unclassified.

1. BELYAKOVA, L. P. - PARISHKURO, N. S.

2. USSR (600)

4. Vakhsh Valley - Soil Fertility

7. Role of alfalfa of various ages in increasing the fertility of the soils in the irrigated areas of the Vakhsh Valley. Soob.TFAN SSSR no. 31

9. Monthly List of Russian Accessions, Library of Congress, March 1953, Unclassified.

S/844/62/000/000/113/129
D207/D307

AUTHORS: Kazanskiy, V. B., Pariskiy, G. B. and Voyevodskiy, V. V.

TITLE: An EPR study of the properties of hydrogen atoms and of defects formed on the irradiation of silica gel

SOURCE: Trudy II Vsesoyuznogo soveshchaniya po radiatsionnoy khimii. Ed. by L. S. Polak. Moscow, Izd-vo AN SSSR, 1962, 656-659

TEXT: Silica gel was investigated because of its special adsorption and catalytic properties. The gel had a specific surface area of 200 m^2/g and contained less than 0.1% Fe and Al impurities. It was irradiated with Co^{60} γ rays, in vacuum, at -196°C and at room temperature, with doses of 5 - 10 megarads. After irradiation at -196°C the EPR spectrum (recorded at the same temperature) indicated the presence of radiation defects and free hydrogen atoms, the latter being formed by radiolysis of the surface OH groups; the H-atom concentration increased with the temperature (200 - 500°C) to which the gel was heated before irradiation. On vacuum

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heating to -150 and -120°C after irradiation, hydrogen atoms recombined slowly into molecules, the recombination being hindered by the location of atoms in deep pores or microcracks in the gel surface. Heating to -150 and -120°C in ethylene and oxygen removed the free hydrogen atoms by chemical reactions as well as by recombination. Vacuum heating to 200 - 300°C for 8 hours, followed by vacuum irradiation at room temperature, gave a quintuplet EPR spectrum with a g-factor identical with that of phenyl picryl hydrazyl. The hyperfine structure of the spectrum was due to the interaction between an unpaired electron of a radical and protons of four OH surface groups. Vacuum heating of silica gel to 500°C followed by room-temperature irradiation in vacuum, generated volume defects similar to F-centers and consisting of electrons captured by oxygen vacancies. Acknowledgments are made to Corresponding Member of the Academy of Sciences of the USSR, G. K. Boreskov, and to Yu. A. Mishchenko of the Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico-Chemical Institute im. L. Ya. Karpov). There are 3 figures.

ASSOCIATION: Institut khimicheskoy fiziki AN SSSR (Institute of Chemical Physics, AS USSR)

13

L 61412-65 EWT(d)/EWP(h)/EWP(l)

ACCESSION NR: AP5019108 UR/0286/65/000/012/0134/0135

AUTHORS: Afonin, A. N.; Yershova, G. I.; Ivanovskiy, K. Ye.; Ioffe, F. S.; Komashenko, A. Kh.; Kon'kova, T. F.; Lipovetskiy, V. A.; Mel'nikov, V. V.; Mishedchenko, Yu. D.; Neverovich, A. M.; Paris-Revuel'ta, A. A.; Preobrashenskiy, O. A.; Rikman, N. A.; Semenov, B. D.; Semenov, V. M.; Sukhanov, A. I.; Sheleg, R. G.; Yagushinskiy, S. M.

TITLE: Transmission device of an overhead thrust conveyor. Class 81, No. 172231

SOURCE: Byulleten' izobreteniy i tovarnykh znakov, no. 12, 1965, 134-135

TOPIC TAGS: overhead conveyor, transmission, crane

ABSTRACT: This Author Certificate presents a transmission device of a suspended thrust conveyor. The device contains spring-supported vanes set in a rotary motion by a star wheel meshing with the drive chain of the conveyor (see Fig. 1 on the Enclosure). To prevent the possibility of wedging the carriage during its transport, the device is provided with a two-armed spring-supported lever. One of the arms serves as a stopper for the carriage, and the other one (provided with a roller) interacts with a circular template fixed on the star wheel. The template has openings for receiving the roller which frees the carriage from the stopper.

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L 61412-65

ACCESSION NR: AP5019108

3

Orig. art. has: 1 diagram.

ASSOCIATION: Vsesoyuznyy nauchno-issledovatel'skiy institut pod"yemno-transportnogo mashinostroyeniya (All-Union Scientific Research Institute of Hoisting and Conveying Machine Construction)

1/4 55

SUBMITTED: 12Aug63 ENCL: 01 SUB CODE: IE

NO REF SOV: 000 OTHER: 000

Card 2/3

SHABALIN, Nazar Nazarovich; PARISTYY, Ivan Leont'yevich; FARBEROV, Ya.D., inzh., retsenzent; MANYKOV, G.S., inzh., red.; USENKO, L.A., tekhn. red.

[Efficient utilization of the technological equipment of stations; work practices of Bryansk II Station of the Moscow Railroad] Effektivnoe ispol'zovanie tekhnicheskikh ustroistv stantsii; opyt raboty stantsii Briansk II Moskovskoi dorogi. Moskva, Vses. izdatel'sko-poligr. ob"edinenie M-va putei soobshcheniia, 1962. 44 p. (MIRA 15:3)
(Railroads—Equipment and supplies)

PEYSAKHSON, I.V.; PARITSKAYA, G.G.

Characteristic function for a spherical reflecting diffraction grating. Opt. i spektr. 18 no.3:534-535 Mr '65.
(MIRA 18:5)

L 31857-65 EWI(m)/T/EWP(t)/EWP(b) Pad IJP(c JD/HW

ACCESSION NR: AP5004270 S/0126/65/019/001/0094/0100

AUTHOR: Geguzin, Ya. Ye.; Paritskaya, L. N.

TITLE: The effect of reversing the preferential flow of vacancies during reciprocal diffusion in crystal bodies

SOURCE: Fizika metallov i metallovedeniye, v. 19, no. 1, 1965, 94-100

TOPIC TAGS: vacancy flow, interdiffusion, preferential flow, Kirkendall effect, Frenkel effect, macroscopic defect, diffusion pair, structural nonequilibrium, volume diffusion, diffusion porosity, copper alloy, nickel alloy

ABSTRACT: It has been shown experimentally that the preferential flow of lattice vacancies can be changed not only in magnitude but also in direction. The experiments in which the direction and magnitude of the preferential flow of lattice vacancies were studied involved the use of samples made up of macrocrystalline polycrystals free of large lattice distortions; this made the diffusion in them differ little from the diffusion in a monocrystalline sample. The effect of macroscopic defects on the diffusion in crystal bodies prompts the assumption that it is possible to reverse the preferential flow of lattice vacancies; in equilibrium systems such a flow results from the inequality of the partial diffusion factors of the component atoms. Tests with copper-nickel samples, in which the degree

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L 31857-65

ACCESSION NR: AP5004270

of nonequilibrium between the copper and nickel was artificially changed, confirmed the possibility of reversing the preferential flow of lattice vacancies. Orig. art. has: 6 figures, 1 table and 1 formula.

ASSOCIATION: Khar'kovskiy gosuniversitet imeni A. M. Gor'kogo (Khar'kov state university)

SUBMITTED: 02Jan64 ENCL: 00 SUB CODE: SS

NO REF SOV: 007 OTHER: 000

Card 2/2

GEGUZIN, Ya.Ye.; GERLOVSKAYA, L.V.; GLADKIKH, N.T.; PALATNIK, L.S.; PARITSKAYA, L.N.

Diffusion activity of vacuum condensates in connection with the effect of reversing the flow of vacancies. Fiz. met. i metalloved. 20 no.4:636-639 O '65. (MIRA 18:11)

1. Khar'kovskiy gosudarstvennyy universitet imeni A.M. Gor'kogo.

ACC NR: AP7004392 SOURCE CODE: UR/0226/67/000/001/0020/0026

AUTHOR: Geguzin, Ya. Ye.; Paritskaya, L. N.

ORG: Khar'kov State University (Khar'kovskiy gosudarstvennyy universitet)

TITLE: Model study of the initial stage of pressure sintering

SOURCE: Poroshkovaya metallurgiya, no. 1, 1967, 20-26

TOPIC TAGS: sintering, model test, surface pressure, powder metal sintering, pressure sintering

ABSTRACT: The kinetics of changes in the area of the particle contact surface in pressure sintering have been determined from changes in the specific gravity of large sintered spheroidal particles. Details of the mechanism of sintering large powder particles are established. The procedure for sintering copper spheroidal particles to a copper plate is described. The dependence of the effective viscosity on pressure is determined. Orig. art. has: 17 formulas, 5 figures, and 1 table. [AM]

SUB CODE: 11/SUBM DATE: 27May66/ORIG REF: 005/OTH REF: 009/

Card 1/1

GEGUZIN, Ya.Ye.; PARITSKAYA, L.N.

Intergranular grooves on the surface of a polycrystal with macroscopic structural defects (in porous materials). Fiz. met.i metalloved. 13 no.4:591-598 Ap '62. (MIRA 16:5)

1. Khar'kovskiy gosudarstvennyy universitet i Institut khimii Khar'kovskogo gosudarstvennogo universiteta.
(Metal crystals—Defects)

GEGUZIN, Ya.Ye.; PARITSKAYA, L.N.

Diffusive coalescence of porosities in crystals with a boundary lattice. Poroshk.met. 2 no.5:20-25 '62. (MIRA 15:11)

1. Khar'kovskiy ordena Trudovogo Krasnogo Znameni gosudarstvennyy universitet im. A.M.Gor'kogo.
(Copper crystals) (Crystal lattices)

GEGUZIN, Ya.Ye.; OVCHARENKO, N.N.; PARITSKAYA, L.N.

Investigating certain physical processes occurring on the surface of crystalline solids at high temperatures. Part 8: Characteristics of striia leveling on the distorted surface of polycrystalline copper. Fiz. met. i metalloved. 12 no.1:42-46 Jl '61. (MIRA 14:8)

1. Institut khimii pri Khar'kovskom gosudarstvennom universitete i Khar'kovskiy gosudarstvennyy universitet.
(Copper--Metallography) (Metals at high temperatures)

GEGUZIN, Ya.Ye.; PARITSKAYA, L.N.

Effect of the expansion of a localized porous region in a crystalline body. Dokl. AN SSSR 141 no.4:833-836 D '61. (MIRA 14:11)

1. Khar'kovskiy gosudarstvennyy universitet im. A.M. Gor'kogo. Predstavleno akademikom P.A. Rebinderom.
(Diffusion) (Metal crystals)

30729

24.7100 1160 1454

S/020/61/141/003/006/021
B104/B125

AUTHORS: Geguzin Ya. Ye., Ovcharenko, [illegible] P[illegible]tskaya, L. N.

TITLE: Interactions between vacancies and grain boundaries

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 141, no. 3, 1961, 603 - 606

TEXT: When studying the physical properties of polycrystals at high temperatures where the mobility of atoms and vacancies is very high, the interaction between vacancies and grain boundaries plays an important role. The authors investigated the grain boundaries as locations of prevalent condensation of excess vacancies and the formation of macroscopic pores and grain boundaries as preferred places for the discharge of excess vacancies from the boundaries of the polycrystal. It is assumed that pores located at grain boundaries will consist of two semi-pores. The profile of such pores is determined by the mutual orientation of grains and by the surface energy. The existence of surface energy between grains will change the equilibrium conditions along fracture lines of the pore profile, and this will cause pores to move along the boundaries (Fig. 1). To estimate the angular change of the fracture line of the pore profile, the relation $\sigma_{ik} = 2\sigma_0(\cos\bar{\alpha} - \cos\alpha)$

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is introduced, where σ_0 denotes the surface energy at the boundary. The author finds the relation $\alpha^* = 2\frac{E_0}{\sigma_0}(A - \ln 2\delta^*)$, where the point angle of the pore is zero, and obtains $\alpha^* \approx 20 - 30^\circ$. Here, $E_0 = Gb/4\pi(1-\nu)$; $A = 4\pi(1-\nu)B_k/Gb^2$, where G denotes the shear modulus, b the Burgers vector, ν Poisson's ratio, B_k the dislocation energy of a nucleus. This representation explains why grain boundaries partly free of pores can be observed in metallic polycrystals. The formation of grooves along grain boundaries at the crystallization boundary is ascribed to excess vacancies in polycrystals, which are due to various causes. The effect of the pores on the formation of grooves between grains is attributed to a coalescence process of the pores. This assumption is corroborated by various experimental data on the bulk distribution of grooves. There are 4 figures and 7 references: 4 Soviet and 3 non-Soviet. The two references to English-language publications read as follows: W. T. Read, W. Shochley, Phys. Rev., 78, no. 3 (1950); W. W. Mullins, J. Appl. Phys., 28, no. 3 (1957).

S/020/61/141/003/006/021
B104/B125

Interactions between vacancies...

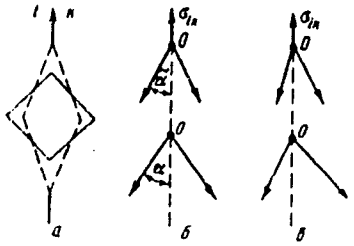
ASSOCIATION: Institut khimii Khar'kovskogo gosudarstvennogo universiteta im. A. M. Gor'kogo (Institute of Chemistry of Khar'kov State University imeni A. M. Gor'kiy)

PRESENTED: June 20, 1961, by P. A. Rebinder, Academician

SUBMITTED: June 12, 1961

Legend to Fig. 1: (a) Diagram of the change of the pore profile under the influence of an intermediate-phase surface energy; (b) pore located symmetrically to the boundary; (c) pore located asymmetrically.

Fig. 1



Card 3/3

GEGUZIN, Ya.Ye., PARITSKAYA, L.N

Reversal effect of the preferred vacancy flow during mutual diffusion in crystalline bodies. Fiz. met. i metall. ved. [illegible] no.1:94-[illegible] Ja '65.

1. Khar'kovskiy gosudarstvennyy universitet imeni Gor'kogo.

GEGUZIN, Ya.Ye.; OVCHARENKO, N.N.; PARITSKAYA, L.N.

Interaction of vacancies with grain boundaries. Dokl. AN SSSR 141 no.3:603-606 N '61. (MIRA 14:11)

1. Institut khimii Khar'kovskogo gosudarstvennogo universiteta im. A.M. Gor'kogo. Predstavleno akademikom P.A. Rebinderom.
(Crystal lattices)

S/226/62/000/005/002/007
E071/E435

AUTHORS: Geguzin, Ya.Ye., Paritskaya, L.N.

TITLE: On the diffusion coalescence of pores in crystalline bodies with a boundary network

PERIODICAL: Poroshkovaya metallurgiya, no.5 , 1962, 20-25

TEXT: Coalescence of pores was studied in polycrystals of electrolytic copper and of cast copper after first subjecting the latter to 100 cycles of heat treatment, quenching from 650°C in cold water. Specimens of porous copper (10 x 6 x 2 mm^3) were annealed in a vacuo at 900, 1000 and 1050°C for various periods up to 27 hours. Then, the size distribution of pores was studied metallographically in arbitrary cross-sections of the specimens. For this purpose after each annealing treatment a layer of about 0.5 mm thick was mechanically removed from the surface of the specimen; according to control experiments the layer removal has no distorting effect on the distribution of pores. The effect of grain boundaries on coalescence of pores was studied by determining the time-dependence of the average size of pores both in the interior of the grains and at the grain boundaries. These

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experiments were conducted on specimens given a preliminary stabilizing treatment as a result of which the total length of the grain boundaries remained practically constant during the experiments. The average size and the rate of growth of pores at the grain boundaries were somewhat greater than those of pores inside the grain boundaries. In addition, the time-dependence of the total length of the grain boundaries in unstabilized specimens was also determined. It is shown that at an early stage of annealing there is interaction between the boundaries and the pores; the stage of detachment of the boundaries from the pores is followed by a stage of transfer of a part of the pores to the boundaries which in time become stable. The experimentally observed coalescence of pores in its advanced stage can be described by the kinetic law previously established for single crystals: $\bar{R} \approx t^{1/3}$ (where $\bar{R}$ - mean pore size, t - time). In regions rich in pores, coalescence may not be accompanied by sintering - a decrease of the total volume of pores, taking place with the aid of the diffusion mechanism. There are 7 figures.

On the diffusion ...

S/226/62/000/005/002/007
E071/E435

ASSOCIATION: Khar'kovskiy ordena Trudovogo Krasnogo Znameni gosudarstvennyy universitet im. A. M. Gor'kogo (Khar'kov Order of the Red Banner of Labour, State University imeni A.M. Gor'kiy)

SUBMITTED: February 5, 1962

Card 3/3

GEGUZIN, Ya.Ye.; PARITSKAYA, L.N.

Collecting recrystallization of polycrystals with macroscopic porosities. Fiz. met. i metalloved. 12 no.6:900-907 D '61. (MIRA 16:11)

1. Khar'kovskiy gosudarstvennyy universitet imeni A.M. Gor'kogo.

32302
S/020/61/141/004/006/019
B102/B104

187510

AUTHORS: Geguzin, Ya. Ye., and Paritskaya, L. N.

TITLE: Effect of expansion of a localized porous zone in a crystalline body

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 141, no. 4, 1961, 833 - 835

TEXT: The authors theoretically and experimentally investigated the expansion of a porous zone in a metal when heated. The object under observation was a crystalline body consisting of a porous and a compact part, the latter surrounding the former. The process of coalescence was accompanied by a diffuse expansion of the porous zone with the internal energy of the system decreasing and its entropy increasing. From the thermodynamical standpoint this process was similar to the expansion of an ideal gas into the vacuum. It is theoretically described on the basis of formulas for the diffusion of vacancies (B. Ya. Pines, ZhETF, 16, 1, 1946). In the porous zone, the concentration of vacancies ξ is higher than the equilibrium concentration ξ_0, hence a vacancy flux will be

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32302
S/020/61/141/004/006/019
B102/B104

Effect of expansion of a ...

observed through the interface between porous and nonporous zone, which is given by $j \approx -D_b \frac{\bar{\xi} - \xi_{o\sim}}{\bar{r}} - D_a \frac{2\sigma}{\bar{r}^2} \frac{\Omega}{kT}$ (σ - coefficient of surface tension, Ω - volume of an atom, D_b, D_a, - diffusion coefficients of vacancies and atoms, respectively, $\bar{r}$ - mean radius of the pores). New pores are formed on the vacancies diffused and, therefore, this process equals a shift of the interface into the compact zone. This effect differs from the diffusion effects which occur at the interface of two different metals as a result of the variety of the partial diffusion coefficients (Kirkendall effect, Frenkel' effect). A series of experiments were carried out to verify the theoretical results: Cylindrical samples of an initial porosity of 15% were molded from copper powder (grain size~50μ). They were annealed and, at the same time, partial sintering took place. Subsequently, they were molded in small copper tubes with the press plunger also consisting of copper, and the porous copper cylinder was entirely surrounded by nonporous metal. Then, the samples were subjected to heat treatment at two different temperatures

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Effect of expansion of a ...

and different holding times and, finally, the radial distributions of pores were examined metallographically. It became obvious that the pores primarily diffused into the nonporous metal along the grain boundaries, and that chains of pores were formed. After 50 hr holding at 1060°C, the copper jacket became completely porous. There are 4 figures and 8 references: 6 Soviet and 2 non-Soviet. The two references to English-language publications read as follows: R. Resnik, L. Seigle, J. of Met. 9, No. 1 (1957); A. Smigelskas, E. Kirkendall, Trans. AIME, T. P. 2071 (1946).

ASSOCIATION: Khar'kovskiy gosudarstvennyy universitet im. A. M. Gor'kogo (Khar'kov State University imeni A.M. Gor'kiy)

PRESENTED: June 20, 1961, by P. A. Rebinder, Academician

SUBMITTED: June 16, 1961

Card 3/3

S/126/61/012/006/015/023
E021/E535

AUTHORS: Geguzin, Ya.Ye. and Paritskaya, L.N.

TITLE: Recrystallization in polycrystals with macroscopic pores

PERIODICAL: Fizika metallov i metallovedeniye, v.12, no.6, 1961, 900-907

TEXT: The influence of pores on recrystallization is of practical interest since components made by powder-metallurgical means often contain pores. Pores can also form during the process of creep of metals and alloys. The retarding influence of pores on the movement of grain boundaries is first discussed from a theoretical point of view. Results are then given of experiments carried out on porous brass from which the zinc had been partially removed at a high temperature, and on polycrystalline copper in which pores had been introduced by thermal cycling. The retardation of grain boundary movement by pores during recrystallization is shown by microphotographs of α-brass. The pores prevent the movement of the grain boundary in their immediate vicinity causing the grain boundary to become bent. The

experiments on copper were more complete. Recrystallization of porous copper was carried out in an argon atmosphere. A polished surface was observed during recrystallization and microphotographs were taken at various stages. It is shown that the boundaries which are thickly populated with pores are extremely stable and do not migrate over long periods of time. The migrating boundaries are locked at pores and thus become bent. The observations agree with the theoretical expectation that, from energy considerations, a pore should be situated in a grain boundary and not within a grain. The effect of pressure was also studied, using samples of porous copper, the pores of which were mainly in the grain boundaries. Annealing was carried out in a water-cooled autoclave at a maximum pressure of 100 atm produced by argon. Under these conditions the number of pores decreased, and the average grain size increased with increase in pressure. There are 5 figures and 14 references: 9 Soviet-bloc and 5 non-Soviet-bloc. The four latest English-language references read as follows: Ref.2: Burke J.Trans.AIMME, 1949, 180, 73; Ref.3: Beck P., Holzworth M., Sperry P. Ibid, 163; Ref.7: Mullin W. W. J.Appl.Phys., 1957, 28, 333; Ref.8: Greenough A.P. Nature, 1950, 166, 904.

Recrystallization in polycrystals ... S/126/61/012/006/015/023
E021/E535

ASSOCIATION: Khar'kovskiy gosudarstvennyy universitet im.
A. M. Gor'kogo
(Khar'kov State University imeni A. M. Gor'kiy)

SUBMITTED: March 20, 1961

Card 3/3

S/126/61/012/001/005/020
E193/480

AUTHORS: Geguzin, Ya.Ye., Ovcharenko, N.N., Paritskaya, L.N.

TITLE: Investigation of certain processes taking place on the surface of crystalline substances at elevated temperatures. VIII. Concerning the character of levelling up of scratches on distorted surfaces of polycrystalline copper

PERIODICAL: Fizika metallov i metallovedeniye, 1961, Vol.12, No.1, pp.42-46 + 2 plates

TEXT: The results of an earlier investigation carried out by the present authors (Ref.1: FMM, 1960, 9, No.4, 569; DAN SSSR, 1960, 130, No.3, 537), showed that the process of levelling up of a scratch on a flat surface of a polycrystalline specimen is affected by its structural state. Thus, a scratch on the surface of a specimen that had undergone prolonged preliminary annealing did not disappear upon subsequent holding at elevated temperatures but only changed its profile in accordance with the orientation of the grains relative to the polished surface. On the other hand, a scratch on the surface of a preliminarily deformed specimen levelled up at a rate which increased with increasing degree of preliminary

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deformation. The object of the present investigation was to obtain additional data which would help in formulating an explanation of these effects. To this end the change of the profile of scratches on the surface of both electrolytically deposited and cast, prolycrystalline copper was studied. The scratches were made with the aid of a diamond pyramid indenter with an angle of 136° between opposite faces. The tests were carried out in hydrogen, on specimens wrapped up in copper foil to minimize the effect of volatilization. An interferometer was used to keep track of the changes in the profile of the scratches. In the first series of experiments specimens of copper electrodeposited at a current density of 0.5 and 10 amp/dm^2, and a cast copper specimen (turned, ground and polished) were studied. Upon holding at 950°C, scratches of all these three specimens levelled off. The rates of levelling of scratches on copper electrodeposited at 10 amp/dm^2 and on the cast specimen with the surface deformed by machining, were about the same and faster than that of the scratch made on copper, electrodeposited at 0.5 amp/dm^2. In the second series of experiments, similar specimens were used which, however, had been given a four-hour anneal at 950°C before inscribing the scratches.

The preliminary annealing slowed down the rate of levelling up of scratches during subsequent heating for all three specimens. The rate of self-healing of the scratch on copper electrodeposited at 10 amp/dm^2 remained faster than that for copper deposited at the lower current density. Since the density of electrodeposited metal decreases (in the case of thin deposits) with the distance from the first deposited layer, the object of the next series of experiments was to study the behaviour of scratches inscribed on the surface of copper electrodeposited to a thickness of 0.5, 1, 2 and 3 μ on annealed, copper strip cathodes. It was found that the thicker the deposit the faster was the rate at which the scratch levelled up on subsequent heating. Finally, it was found that (other factors being equal) the rate of levelling up of scratches inscribed on electrodeposited copper depended on the direction of the scratch relative to the direction of the current during electrodeposition. The results obtained are discussed in terms of the effect of structural defects on the self-diffusion mechanism of levelling up of the surface scratches. It is postulated that the experimental facts may be explained if it is assumed that side by side with surface diffusion, subsurface diffusion takes place in a

layer which is considerably thicker than the interatomic distance of the metal. The fact that the profile of the scratch remained smooth during the levelling up process in all the cases studied was attributed to small degree of anisotropy of the coefficient of surface tension of copper, and to the presence of misoriented elements of a dispersed structure in the surface layer. The results of the present investigation are in agreement with those obtained since by J.M.Blakely and H.Mykura (Ref.7: Acta met., 1961, 9, No.1, 23). There are 9 figures and 7 references: 5 Soviet and 2 non-Soviet. The two references to English language publications read as follows: Moore A.J.W., Acta met, 1958, 6, No.4, 293; Blakely J.M. and Mykura H. Acta met., 1961, 9, No.1, 23.

ASSOCIATION: Institut khimii KhGU Khar'kovskiy gosuniversitet
(Institute of Chemistry, KGU Khar'kov State University)

SUBMITTED: October 3, 1960

Card 4/4

S/126/62/013/004/015/022
E111/E435

AUTHORS: Geguzin, Ya.Ye., Paritskaya, L.N.

TITLE: Inter-grain channels on the surface of a polycrystal with macroscopic defects in the structure (in porous bodies)

PERIODICAL: Fizika metallov i metallovedeniye, v.13, no.4, 1962, 591-598

TEXT: In defective-structure bodies the effects leading to normal formation at high temperatures of channels along grain boundaries can be intensified. With porous bodies the process can be complicated by the diffusion of vacancies from pores to the specimen surface along the grain boundaries. Modern views are that boundaries play a very important part in the compacting of porous bodies and suggest that sintering is accompanied by intensive development of inter-grain channels. This effect of pores can also be considered as being a pore-coalescence effect. The object of the present work was to check the correctness of these views and to confirm them qualitatively, thereby obtaining additional information on the peculiarities of diffusion processes

Inter-grain channels ...

in bodies with macroscopic defects (particularly in powder compacts). The interferometric method was used to study qualitatively the kinetics of inter-granular channel development on copper specimens with various pore-type defects. Specimens wrapped in copper foil were annealed in hydrogen at 800°C. For an evaluation of the kinetics the authors extend the treatment of W.W.Mullins (J. Appl. Phys., v.28, no.3, 1957) to porous bodies, taking into account the additional diffusion of vacancies from pores. They show that the effective diffusion coefficient for the process is 20 to 30 times greater than the coefficient of surface diffusion: this is in line with other observations, such as the disappearance of surface scratches. Sintering can be explained in terms of surface channel development (through the arrival of vacancies) and disappearance. There are 7 figures.

ASSOCIATION: Khar'kovskiy gosudarstvennyy universitet
Institut khimii KhGU (Khar'kov State University
Chemistry Institute KhGU)

SUBMITTED: July 17, 1961

Card 2/2

S/193/60/000/008/004/018
A004/A001

AUTHOR: Paritskaya, V. P.

TITLE: The Multi-Purpose Double-Column 2460 Jig-Boring Machine

PERIODICAL: Byulleten' tekhniko-ekonomicheskoy informatsii, 1960, No. 8, pp.21-23

TEXT: To increase the technological possibilities of the 2B440 (2V440) and 2450M single-spindle jig-boring machines, the Moskovskiy zavod koordinatno-rastochnykh stankov (Moscow Jig-Boring Machine Plant) in 1959 brought out the 2460 double-column jig-boring machine. It has been devised for the machining of holes in jigs, fixtures and various parts where a high precision of the relative position of these holes is imperative. Besides drilling and boring, precision milling operations, facing, checking of linear dimensions can be carried out on the machine. The machine is equipped with two boring spindles. The coordinates on the machine are read off with the aid of a projection (screen) optical system. Three glass rulers with millimeter graduation are used as scales. The largest glass ruler for the longitudinal table motion is 1,400 mm long. The whole coordinate dimensions, including the integers and fractions, are projected and read off on the raster network of the screen with a magnification of 130 diameters. Thus the operator is

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freed from the manipulation of reading the dimensions in three places as it is the case with optical machines with ocular optics (the 2450M machine) or machines with screens and metallic rulers (the Swiss make SIPO). The high-precision instrumentation makes it possible to use the 2460 jig-borer as a measuring machine. The reading on the screen is effected with an accuracy of up to 0.001 mm in three mutually perpendicular directions. The use of the glass scales and raster screens produces the prerequisites for a program-controlled operation of the 2460 machine. Based on the model 2460 the program-controlled 2460P model was designed. The coordinate displacements in three mutually perpendicular directions are effected by three independent electric drives with a wide regulation range; the drives are operated through a gear box from two-speed asynchronous 2-kw electric motors, ensuring 18 different numbers of revolution of the spindle. The jig-boring machine is equipped with a switch-off device, stopping the automatic feed of the boring spindle at a given depth. The cross-beam lift has been carried out with the aid of screws with ball nuts which made it possible to eliminate the cross beam balance by weights and thus reduce the weight of the machine considerably. Each of the three traveling units of the machine has a device for preliminary coordinate setting which makes it possible to select the following set of coordinates during operation. This device increases the efficiency of the machine by 15-20%. The multi-purpose

The Multi-Purpose Double-Column 2460 Jig-Boring Machine

swivel table of the machine ensures the machining of slanting holes and holes the dimensions of which are given in the polar coordinate system. The controls of the machine are centralized on a suspension panel. The author presents the following technical characteristics: working surface of the table (width x length) - 1,000 x 1,600 mm; distance between columns (clearance) - 1,400 mm; maximum drilling diameter in steel - 40 mm; maximum boring diameter - 250 mm; maximum weight of workpiece being machined - 1,500 kg; overall dimensions - (length) 3,555 x (width) 2,910 x (height) 3,365 mm; weight (without packing) - 16.5 tons. [Translator's note: in the article a weight of 16.5 kg is given, which is obviously a misprint]. The author points out that jig-boring machines equal in dimensions to the model 2460 are at present not produced by other Soviet plants. There is 1 figure.

PARITSKAYA, V. P.

The 2460 universal two-column jig boring machine. Biul. tekh.-ekon. inform. no.8:21-23 '60. (MIRA 13:9)
(Drilling and boring machinery)

PARITSKIY, L.G.; RYVKIN, S.M.

Investigation of "nonlinear" processes of relaxation of photoconductivity in the presence of attachment levels. Fiz. tver. tela 3 no.8:2245-2258 Ag '61. (MIRA 14:8)

1. Fiziko-tekhnicheskiy institut im. A.F. Ioffe AN SSSR, Leningrad.

(Photoconductivity)
(Electrons—Capture)
(Crystal lattices)

L 18000-63 EWT(1)/EWG(k)/EWP(q)/EWT(m)/BDS AFFTC/ASD/ESD-3/IJP(C)
Pz-4 RDW/AT/JD

ACCESSION NR: AP3001286 S/0181/63/005/006/1649/1656

AUTHORS: Mekhtiyev, R. F.; Paritskiy, L. G.; Ryvkin, S. M.

TITLE: Kinetics of impurity photoconductivity in crystals of GaSe

SOURCE: Fizika tverdogo tela, v. 5, no. 6, 1963, 1649-1656

TOPIC TAGS: impurity photoconductivity, emitter level, capture cross section, multiple capture, valence band, impurity absorption, Ga, Se

ABSTRACT: The purpose of this work was to study the spectrum of local levels responsible for impurity photoconductivity (emitter levels), to examine the parameters of these centers, and the role of the levels of capture by analyzing spectral dependence of standard photoconductivity and the structure of relaxation curves. In single crystals of GaSe the authors detected considerable photosensitivity in the region of impurity absorption up to about 3 microns, determined by the presence of 3 types of "emitter" levels lying at 0.4, 0.56, and 0.71 ev from the top of the valence band. Investigation of relaxation of photoconductivity permitted them to determine the capture cross sections of nonequilibrium holes, each of the levels of capture cross section of photons, and

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L 18000-63

ACCESSION NR: AP3001286

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the concentration of levels. They established the presence of levels of multiple capture and showed that when emitter levels are nearly full and equilibrium conductivity is considerable the presence of capture does not affect the measured relaxation time. By comparatively simple measurements of the concentration of emitter levels and the capture cross sections of photons they found it possible to determine the basic parameters of local levels responsible for the impurity photoconductivity. Orig. art. has: 6 figures and 7 formulas.

ASSOCIATION: Fiziko-technicheskiy institut im. A. F. Ioffe AN SSSR, Leningrad (Physical and Technical Institute); Institut fiziki AN Az. SSR, Baku (Institute of Physics, Academy of Sciences, Azerbaijan SSR)

SUBMITTED: 29Jan63 DATE ACQ: 01Jul63 ENCL: 00

SUB CODE: PH NO REF SOV: 012 OTHER: 002

Card 2/2

34238
S/181/62/004/002/028/051
B101/B102

9.4177 (also 1051, 1482)

AUTHOR: Paritskiy, L. G.

TITLE: Particularities of impurity photoconductivity in the presence of several types of local levels in the forbidden band of a semiconductor

PERIODICAL: Fizika tverdogo tela, v. 4, no. 2, 1962, 470-477

TEXT: Processes of generation, capture, and adhesion of carriers in the case of monopolar impurity photoconductivity and in the presence of local levels have been studied. For a sample with two levels, one obtains

$$\Delta n = \sum_{k=1}^{r} \frac{q_k m_{0k} I}{q_k I + \gamma_k \left(N_{CM}^{(k)} + n_0 + p_{0k}\right) + \left[q_k I + \gamma_k \left(N_{CM}^{(k)} + n_0\right)\right] \sum_{\substack{i=1 \\ i \neq k}}^{r} \frac{\gamma_i p_{0i}}{q_i I + \gamma_i \left(N_{CM}^{(i)} + n_0\right)}} \quad (7),$$

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where Δn is the variation in electron concentration, q_k is the cross section for the capture of an electron on a level of the type k, and n_{ok} is the equilibrium concentrations of electrons on the k-type level; $N_{CK}^{(k)} = N_C \exp(-\Delta E_k/kT)$, is the density of states in the conduction band of the levels of k-type draps, N_C is the effective level density in the conduction band, ΔE_k is the level energy, n_o is the total equilibrium concentration of electrons, p_{ok} is the equilibrium concentration of holes and q_k is the photon capture cross section of an electron. It follows from Eq. (7) that the levels affect one another. A redistribution of n_o between the levels occurs, whereby the intensities of release and trapping on each level are changed. The lux-ampere characteristics exhibits a stepwise course. If $q_k = 0$ $(k \neq j)$ the k-type level is an adhesion level for electrons. Supposing all the levels, except the levels of type j, are adhesion levels, the steady-state photoconductivity can be expressed by

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Particularities of impurity ...

$$\Delta n = q_j m_{0j} I \left\{ q_j I + \gamma_j (N_{CM}^{(j)} + n_0 + p_{0j}) + \right.$$
$$\left. + [q_j I + \gamma_j (N_{0M}^{(j)} + n_0)] \sum_{\substack{i=1 \\ i \neq j}}^{r} \frac{p_{0i}}{N_{0M}^{(i)} + n_0} \right\}^{-1}, \qquad (11).$$

With $q_2 = 0$ and slight equilibrium filling, the steady-state photoconductivity decreases with increasing $M_2/N_{CM}^{(2)}$, owing to the transition of electrons from the emitting levels to the adhesion level. If q_M is much greater than q_L, a "flashup" of the relaxation curve will occur with increasing light intensity (Fig. 6). Either addition of the decreasing exponential functions with different time constants and amplitudes or a change in sign of $\Delta n(t)$ occurs, depending on the ratio of the concentrations M/L of two types of center. This effect is attributed to the decreasing occupation of the level with increasing q, and also to the redistribution of electrons between the conduction band and the second level if q is small. Illumination results in the filling of the first level by equilibrium carriers

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Particularities of impurity ...

from the conduction band. As a result, their concentration decreases until the electrons are liberated from the second level and equilibrium is reestablished. A paper by S. G. Kalashnikov (ZhTF, 26, 241, 1956) is referred to. S. M. Ryvkin is thanked for a discussion. There are 7 figures and 12 references: 10 Soviet and 2 non-Soviet. The two references to English-language publications read as follows: H. Y. Fan, Phys. Rev., 92, 6, 1953; I. R. Haynes, I. A. Hornback, Phys. Rev., 97, 2, 1955; ibid., 100, 12, 1955.

ASSOCIATION: Fiziko-tekhnicheskiy institut im. A. F. Ioffe AN SSSR, Leningrad (Physicotechnical Institute imeni A. F. Ioffe, AS USSR, Leningrad)

SUBMITTED: March 31, 1961 (initially), September 25, 1961 (after revision)

Fig. 6. "Flashup" of impurity conductivity at different light intensities L
Legend: abscissa: t, relative units; ordinate: Δn, relative units;
$\Delta n_{cm} = n_{stat}$ = static concentration of electrons in the conduction band.

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MEKHTIYEV, R.F.; PARITSKIY, L.G.

Kinetics of the photoconductivity of GaSe. Fiz. tver. tela 4 no.5:1222-1226 My '62. (MIRA 15:5)

1. Institut fiziki AN AzSSR, Baku i Fiziko-tekhnicheskiy institut imeni A.F. Ioffe AN SSSR, Leningrad.
(Gallium selenide) (Photoconductivity)

L 10092-63 EWT(l)/EWG(k)/ERC(b)-2/BDS AFFTC/ASD/ESD-3 Pz-l AT/
IJP(C) S/0120/63/000/003/0150/0153
ACCESSION NR: AP3002742 66
62

AUTHOR: Peritskiy, L. G.

TITLE: A differential method for investigation of relaxation processes

SOURCE: Pribory i tekhnika eksperimenta, no. 3, 1963, 150-153

TOPIC TAGS: relaxation processes, differential method, semiconductor impurity centers, photoconductive cell, rectangular light pulses, photomultiplier, integrating network

ABSTRACT: This paper presents a new approach to problems concerning the parameters and impurity centers of semiconductors. A precise differential method is described for measuring the time constants of photoelectrical and electrical processes. In this method a photoconductive cell is illuminated by rectangular light pulses. A portion of a light beam is guided by means of semitransparent mirrors onto the photomultiplier; the output of the photomultiplier is loaded by an integrating network consisting of a variable capacitor and a potentiometer. The signal, which is the difference between the signal developing in the photoconductive cell and the signal taken from the integrating RC network, is applied through a wide-band amplifier to an oscilloscope. By varying the

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capacitive and resistive components of the integrating network, the amplitudes of both the investigated signal and the photomultiplier signal are equalized; and then the value of the RC is made approximately equal to the time constant of the relaxation process. This is observed when the curve on the oscilloscope screen approaches a straight line. The sensitivity of the method was experimentally investigated during measurements of time constants of 10 sup -5 to 10 sup -1 sec. Measurements were made with a silicon photodiode (time constant, 10 sup -7 sec) loaded by an integrating network (RC = 4 x 10 sup -4 sec). The rise time of an exciting light pulse was 2 x 10 sup -6 sec. It followed that the accuracy of measuring the time constant increases up to 0.04% with increased voltage sensitivity. The new method is considered applicable to the study of the kinetics of luminescence and to the study of transient electric processes. "The author thanks S. M. Ryvkin for his valuable observations and interest in the project and V. A. Bangsytis and E. G. Pelya for their help in the conduct of the experiment." Orig. art. has: 4 figures and 4 formulas.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN SSSR (Physicotechnical Institute AN SSSR)

SUBMITTED: 09Jul62 DATE ACQ: 12Jul63 ENCL: 00
SUB CODE: 00 NO REF SOV: 004 OTHER: 000
Card 2/2 VK/dk

ZIBUTS, Yu.A.; PARITSKIY, L.G.; RYVKIN, S.M.

Some properties of silicon with admixtures of mercury, tungsten, molybdenum, and platinum. Fiz. tver. tela 5 no.11:3301-3304 N '63. (MIRA 16:12)

1. Fiziko-tekhnicheskiy institut imeni A.F.Ioffe AN SSSR, Leningrad.

AFANAS'YEV, V.F.; PARITSKIY, L.G.; PRIKOT, N.F.; RYVKIN, S.M.

Effect of trapping levels on the lux-ampere characteristics in silicon. Fiz. tver. tela 5 no.11:3179-3182 N '63. (MIRA 16:12)

1. Fiziko-tekhnicheskiy institut imeni A.F.Ioffe AN SSSR, Leningrad.

PARITSKIY, L.G.; RYVKIN, S.M.

Effect of adhesion levels on the relaxation of photoconductivity in CdS single crystals. Fiz. tver. tela 2 no.3:547-557 Mar '60. (MIRA 14:8)

1. Fiziko-tekhnicheskiy institut AN SSSR, Leningrad.
(Cadmium sulfide crystals) (Photoconductivity)

ACCESSION NR: AP4028436 S/0181/64/006/004/1096/1099

AUTHOR: Paritskiy, L. G.

TITLE: Dependence of steady impurity photoconductivity and lifetime on the Fermi level in a semiconductor

SOURCE: Fizika tverdogo tela, v. 6, no. 4, 1964, 1096-1099

TOPIC TAGS: impurity photoconductivity, Fermi level, semiconductor property, carrier concentration, forbidden band

ABSTRACT: For impurity photoconductivity (in contrast to intrinsic photoconductivity), the generation of carriers, as well as recombination, depends on uniform filling of local levels in the forbidden zone. The author has computed the dependence of steady nonequilibrium concentration of current carriers, the dependence of carrier lifetime, and the dependence of rate of carrier generation on the Fermi level in samples having unipolar impurity photoconductivity with a single type of impurity center. The dependence exhibits three segments, the character of generation and recombination differing for each. At first, as concentration increases, the concentration levels begin to fill and the generation rate declines, becoming

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ACCESSION NR: AP4028436

constant, but the lifetime increases at the same time because of diminution in concentration in the unfilled levels. At the beginning of the second segment, the levels may be considered half filled, corresponding to the condition when the Fermi level coincides with the level of emitting centers in the forbidden band. Increase in concentration takes place because of increase in lifetime. In the third segment, further increase in concentration leads to decline in concentration change and in lifetime. This follows from a change in character of recombination with a constant intensity of carrier generation. It appears that an increase in concentration of impurity centers leads to an increase in sensitivity, while the time lag of impurity photoconductivity declines simultaneously. "The author expresses his thanks to S. M. Ryvkin for his valuable suggestions and his interest in the work." Orig. art. has: 2 figures and 12 formulas.

ASSOCIATION: Fiziko-tekhnicheskiy institut im. A. F. Ioffe AN SSSR, Leningrad (Physicotechnical Institute, AN SSSR)

SUBMITTED: 22Oct63 DATE ACQ: 27Apr64 ENCL: 00

SUB CODE: EC, SS NO REF SOV: 001 OTHER: 001

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PARITSKIY, L.G.

Differential method for studying relaxation processes. Prib. i tekh. eksp. 8 no.3:150-153 My-Je '63. (MIRA 16:9)

1. Fiziko-tekhnicheskiy institut AN SSSR.
(Photoelectric measurements)

ARKAD'YEVA, Ye.N.; PARITSKIY, L.G.; RYVKIN, S.M.

Investigating the kinetics of infrared impurity photoconductivity in cadmium sulfide induced by preliminary illumination. Fiz.tver. tela 2 no.6:1160-1168 Je '60. (MIRA 13:8)

1. Fiziko-tekhnicheskiy institut AN SSSR, Leningrad.
(Photoconductivity) (Cadmium sulfide--Electric properties)

PARITSKIY, L.G.; ROGACHEV, A.A.; RYVKIN, S.M.

Kinetics of phototubes with "extrinsic" photoeffect from a metal into a semiconductor. Fiz.tver.tela 3 no.5:1613-1616 My '61. (MIRA 14:6)

1. Fiziko-tekhnicheskiy institut imeni A.F.Ioffe AN SSSR, Leningrad.
(Photoelectric cells) (Semiconductors)

GRINBERG, A.A.; PARITSKIY, L.G.; RYVKIN, S.M.

Effect of adhesion levels in semiconductors on the stationary photoconductivity and life time of nonequilibrium current carriers. Fiz.tver.tela 2 no.7:1545-1561 Jl 60. (MIRA 13:8)

1. Fiziko-tekhnicheskiy institut AN SSSR, Leningrad.
(Semiconductors) (Photoconductivity)

PARITSKIY, L.G.

Characteristics of extrinsic photoconductivity of a semiconductor with several types of local levels in the forbidden zone. Fiz. tver.tela 4 no.2:470-477 F '62. (MIRA 15:2)

1. Fiziko-tekhnicheskiy institut imeni A.F.Ioffe AN SSSR, Leningrad.
(Semiconductors) (Photoconductivity) (Quantum theory)

PARITSKIY, L. G.

USSR

The photocurrent in single crystals of cadmium sulfide. S. M. Ryvkin and L. G. Paritskiĭ. *Zhur. Tekh. Fiz.* 24, 8-17(1954).—Expts. are reported on the drift of carriers in CdS crystals having several annular probes and illuminated between the 2 center probes. The "photorectification" that occurs when the crystal is illuminated at one electrode only in the direction of the axis is due to the formation of a space charge in the dark part; the c.d. is proportional to V^2 according to $j = 9\mu\varepsilon V^2/32\pi l^3$ (where μ is the mobility, ε the dielec. const.). It is shown on crystals with probes that this equation is not valid at small voltages, and this deviation is attributed to the formation of a surface charge that can be as high as 0.7 v. Infrared irradiation decreases the photocurrent caused by green light according to $k = (J_{g.} - J_{ir.+g.})/J_{g.}$ with k being a function of the intensities $J_{infrared}$ and J_{green}. It is shown from the dependence that a region of superlinearity of photocurrent must exist under infrared irradiation. The currents produced by 2 light beams of the same spectral compn. do not follow additive laws; therefore, there is enhancement of current produced by pulsed irradiation superposed on continuous irradiation. The enhancement of sensitivity to α-particle irradiation by simultaneous irradiation with green light is discussed and it is shown that α-particles produce secondary currents.

S. Pakswer

Parfitskiy, A. G.

MASLENNIKOV, MIKHAIL MIKHAILOVICH, A. G. PARFITSKIY, and A. S. PROLOV.

Raschet kilometrovykh raskhodov goriuchego dlia samoleta s nagnetatel'nymi dvigateliami. Moskva, 1940. 104 p. (TSAGI. Trudy, no.491)

Title tr.: Calculation of specific fuel consumption per km for aircraft equipped with booster fuel pumps.

NCF

SO: Aeronautical Sciences and Aviation in the Soviet Union, Library of Congress, 1955

PARITSKIY, L.G.

82546

S/181/60/002/007/026/042
B006/060

24.7700

AUTHORS: Grinberg, A. A., Paritskiy, L. G., Ryvkin, S. M.

TITLE: The Influence of Adhesion Levels in Semiconductors on the Steady Photoconductivity and the Lifetime of the Minority Carriers

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 7, pp. 1545-1561

TEXT: The present bulky article deals with a comprehensive study of the influence exerted by adhesion levels introduced into a crystal upon the carrier recombination in the steady state (thus, upon τ_p, τ_n, and $\Delta\sigma$) taking place above other traps located in the forbidden band. The study is extended to cover the influence of filling of adhesion levels on the dependence of τ_n and τ_p on temperature and light intensity. In the introduction, the authors discuss a number of relevant publications. In the first section of the paper, the influence of adhesion levels on τ_n and τ_p in the steady state is qualitatively examined by means of an example

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The Influence of Adhesion Levels in Semiconductors on the Steady Photoconductivity and the Lifetime of the Minority Carriers

of a high injection level. This is done on the model of a semiconductor in whose forbidden band there exist two types of local levels with sharply differing properties (Fig. 1): the S levels are assumed to be traps for the minority electrons from the conduction band and the holes from the valency band, i.e., they are recombination centers for the light-produced minority charges. The M levels are, due to electron exchange, connected with the conduction band (the electron exchange with the valency band is forbidden), and therefore they are adhesion levels for the electrons. It is shown that the electron and hole concentrations in the S centers are closely related to the electron and hole concentrations in the bands. E. g., if the electron concentration in the conduction band is changed anyhow, the electron lifetime $\tau_n = 1/\gamma_n p_s$ in this band is decreased, and the hole lifetime $\tau_p = 1/\gamma_p n_s$ in the valency band grows. This is the sense in which the introduction of adhesion levels acts. (γ_n and γ_p are the trapping factors, n_s and p_s the electron and hole concentrations in the S centers; $n_s + p_s = S$, the concentration of the recombination centers). In the following

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The Influence of Adhesion Levels in Semiconductors on the Steady Photoconductivity and the Lifetime of the Minority Carriers

sections of the paper the authors first examine in a general way the influence exerted by adhesion levels in the case of a high injection level at a low concentration of the recombination centers, and then the same is done for a semiconductor with two types of injection levels. In this semiconductor the forbidden band contains, besides the recombination centers S and the adhesion levels M for the electrons, adhesion levels L for the holes from the valency band (Fig. 7). Section 4 again treats, for a semiconductor with one adhesion level in the forbidden band, the case of a high injection level, but at a high concentration of the recombination centers S. Finally, section 5 deals with the case of a low injection level at an arbitrary concentration of the recombination centers. Here, the Fermi quasi-levels of electrons and holes practically coincide, and the traps may be classified into adhesion levels and recombination centers only on the basis of the various trapping cross sections. (5.9) and (5.10) are first generally derived for τ_n and τ_p; for M = 0 they go over to (5.11). The latter formulas are then further treated for the special cases of an n-type and a p-type semiconductor.

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The Influence of Adhesion Levels in Semiconductors on the Steady Photoconductivity and the Lifetime of the Minority Carriers

S/181/60/002/007/026/042
B006/B060

S. G. Kalashnikov is mentioned. There are 10 figures and 19 references: 5 Soviet, 9 US, and 3 German.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN SSSR Leningrad (Institute of Physics and Technology of the AS USSR, Leningrad)

SUBMITTED: November 27, 1959

Card 4/4

38919
S/181/62/004/006/030/051
B104/B112

9,4177

AUTHORS: Arkad'yeva, Ye. N., Paritskiy, L. G., and Ryvkin, S. M.

TITLE: A method of long-wave photoelectric probing of local levels in semiconductors

PERIODICAL: Fizika tverdogo tela, v. 4, no. 6, 1962, 1578 - 1588

TEXT: In the new method described here for the investigation of relaxation processes in semiconductors, the sample is irradiated with a probing pulse of long-wave light (Fig. 1б) along with a sufficiently long square light pulse (Fig. 1a) that excites the relaxation process under investigation. The wavelength of the probing pulse is so chosen that the levels under consideration are ionized. In this case, the signal on the oscilloscope screen has a definite form (Fig. 1в). The concentrations of free and bound carriers can be determined from the slope of the curve on the screen and from its peak produced by the probing pulse. The sample can be irradiated with a series of probing pulses during the interval of a single square pulse (Fig. 2), and this enables the relaxation of the concentrations to be determined. The light from the

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27276

S/181/61/003/008/006/034
B102/B201

94.7700 (1035, 1138)
26.1512

AUTHORS: Paritskiy, L. G. and Ryvkin, S. M.

TITLE: Study of "nonlinear" processes of relaxation of photoconductivity in the presence of adhesion levels

PERIODICAL: Fizika tverdogo tela, v. 3, no. 8, 1961, 2245 - 2258

TEXT: The investigations described here in great detail were conducted for the purpose of calculating the relaxation of monopolar photoconductivity with any ("nonlinear") filling of adhesion levels. The relaxation curves are shown in this case to display characteristic sections or points, by which the level parameters can be calculated. Earlier already, Ryvkin had studied the effect of carrier trapping by adhesion levels upon the relaxation of monopolar photoconductivity in the "linear" case (adhesion levels are little filled during the relaxation process, and the carrier lifetime is constant). By way of experiments, the authors have discovered an intense α-adhesion on the relaxation curves of CdS single crystals (FTT, II, 3, 1960). The study is here continued by first observing theoretically the kinetics of monopolar photoconductivity at any degree of excitation (considerable

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Study of "nonlinear" processes of...

filling of adhesion levels). The effect of a high filling degree of adhesion levels upon the existence of a nonlinearly ascending section in the photoconductivity curve is examined in Chapter 1 of the present paper on the basis of the band scheme (Fig. 1). The forbidden band contains the recombination centers S, to which the fact is to be ascribed that the electron lifetime τ_n in the conduction band is large compared with the hole lifetime τ_p in the valence band, so that photoconduction is purely n-type. In addition, the forbidden band includes adhesion levels of concentration M; multiple adhesion on them should be possible. The photoelectron concentration (n) in the conduction band grows in the initial stage of relaxation ($t \ll \tau_n$) following the law

$$n = \beta k J \theta^2 \gamma M \left(1 - e^{-\frac{t}{\theta}}\right) + \frac{1}{2} \beta k J (\tau_{n_0} - t) \left[\pm \sqrt{1 + \frac{4 N_{e_0} t}{\beta k J (\tau_{n_0} - t)}} - 1\right]; \quad (9)$$

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where β denotes the quantum yield of the inner photoelectric effect, k is the light absorption coefficient, J is the light intensity, γ is the trapping factor of electrons from the c-band onto the M levels, $\theta = 1/\gamma(M+N_{cM})$, $N_{cM} = N_c \exp(-\Delta E_M/kT)$, N_c is the effective state density in the c-band, ΔE_M the energy of M levels, calculated from the bottom of the conduction band; $\theta \ll (M+N_{cM})/\beta kJ$. Fig. 2 shows n(t) in case of "nonlinear" filling of the adhesion levels. The greater the light intensity, the smoother will be the course of the n(t) curves, i. e., the larger the first linear sections, the farther they will be shifted to the right. Chapter 2 deals with the effect of adhesion levels upon the general character of the relaxation curves of photoconductivity. This is done for the case of τ_n = const and in the presence of an intense multiple adhesion. An S-shaped ascent of photoconductivity can be observed in this case. An experimental study was made of the photoconductivity curves on CdS single crystals that were strongly alloyed with silver; the experimental arrangement shown in Fig. 6 was used for the purpose. Square light pulses were used (front 2 sec) that were produced by means of a disk M rotating

27276 S/181/61/003/008/006/036
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Study of "nonlinear" processes of ...

in the pre-vacuum chamber. The experimental curves showed a good agreement with theory. A method for the optical longwave sounding of local levels is discussed in chapter 4. The method is essentially based on what follows: the intensity of carrier generation, G, can be determined from the initial inclination of the curve of the growth of impurity conductivity, and is proportional to the concentration of carriers occupying a given level; $g = mqJ$; m is the carrier concentration on a given level; q the photon capture cross section, and J the intensity of the longwave light. Since qJ is easily determinable, the m can be determined from the measurement of g. If a semiconductor is irradiated with a longwave light pulse having a shorter duration than the time of growth of impurity photoconductivity, $m = \sigma\Delta i_\phi$, will be valid, where i_ϕ is the amplitude value of the photocurrent pulse induced by the light pulse and σ is an experimental constant which, inter alia, depends on the form of the light pulse. For the case of a linear filling of adhesion levels, Fig. 12 presents the curves of the optical sounding of adhesion levels during the relaxation of photoconductivity. Oscillograms obtained experimentally are in agreement with them. By optical sounding, i.e., m, dm/dt, and dm/dt can be determined at any instant. In case of nonlinear relaxation processes, determinations are made

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Study of "nonlinear" processes of... 27276 S/181/61/003/008/006/034 B102/B201

analogously. Yu. A. Zibuts and A. A. Purtskhvanidze are thanked for their assistance. M. I. Boyko and V. Ye. Lashkarev are mentioned. There are 13 figures and 17 references: 9 Soviet-bloc and 8 non-Soviet-bloc.

ASSOCIATION: Fiziko-tekhnicheskiy institut im. A. F. Ioffe AN SSSR Leningrad (Institute of Physics and Technology imeni A. F. Ioffe AS USSR, Leningrad)

SUBMITTED: February 4, 1961

Fig. 1: Scheme of electron transition

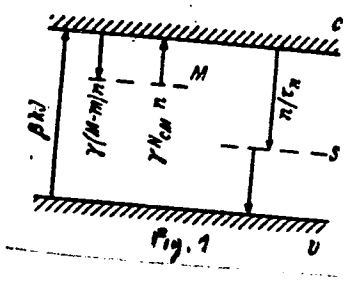

Fig. 1

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23134
S/181/61/003/005/039/042
B111/B202

9.4160

AUTHORS: Paritskiy, L. G., Rogachev, A. A., and Ryvkin, S. M.

TITLE: Kinetics of photocells with an "external" photoelectric effect from a metal into a semiconductor

PERIODICAL: Fizika tverdogo tela, v. 3, no. 5, 1961, 1613-1616

TEXT: The paper by R. Williams and R. Bube (Appl. Phys., 36, No. 6, 1960) gives a series of proofs for the existence of an "external" photoelectric effect taking place from a metal into a semiconductor in photocells consisting of a Cu-coated low-resistance CdS crystal. Earlier measurements made by the author showed a low inertia in such photocells. The studies of the kinetics of the photocells are similar to those of photocells with n-p junctions which were dealt with in Ref. 3 (S. M. Ryvkin, ZhTF, XXVII,8, 1676, 1957) and Ref. 4 (S. M. Ryvkin, N. B. Strokan, L. L. Makovskiy, ZhTF, XXVIII, 9, 1958) for, actually, a metal connected with an n-type semiconductor replaces a p-type semiconductor. In this case those electrons which have absorbed a photon and whose energy exceeds the barrier height play the part of the unbalanced minority carriers in the metal. On the same

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Kinetics of ...

conditions as in Ref. 3 a value of $\sim 10^{-12}$ sec was obtained for the time in which a photoelectron passes the region of space charge. In the following, the authors demonstrate that the relaxation time of a photocell τ, depends on the charging resistance in the following way: with $R_H \gg R_{BH}$ (R_H = charging resistance, R_{BH} = external differential resistance of a photocell) τ, is independent of R_H and equal to $R_{BH}C$ (C = capacitance between the layer of space charge and support); with small R_H and if $R_T \ll R_{BH}$ (R_T = resistance of the semiconductor) τ, depends linearly on R_H. Photocells Cu - CdS with a resistivity CdS being $\approx$1 ohm.cm were measured. The Cu-layer was electrolytically applied from a Cu_2SO_4 solution by N. F. Prikot, student of the LGU (Leningrad State University). τ, was measured by the method of phase compensation of light which was sinusoidally modulated by a frequency of 1 Mc. 240 and 260 were obtained for the capacitance of the space charge. The capacitance of the support was 60 pf. 1 kohm and 440

ohms were obtained for for R_{BH}. Photocells of this type can be used as photosensitive receivers with low inertia for the red and infrared range of the spectrum; also the range of sensitivity can be varied according to the metal and the semiconductor employed. The authors thank F. M. Berkovskiy for measuring the time constants. There are 2 figures and 5 references: 4 Soviet-bloc and 1 non-Soviet-bloc.

ASSOCIATION: Fiziko-tekhnicheskiy institut imeni A. F. Ioffe AN SSSR Leningrad (Institute of Physics and Technology imeni A. F. Ioffe AS USSR Leningrad)

SUBMITTED: November 26, 1960

81634

S/181/60/002/06/22/050
B006/B056

24.7700

AUTHORS: Arkad'yeva, Ye. N., Paritskiy, L. G., Ryvkin, S. M.

TITLE: Investigation of the Kinetics of Infrared Impurity Photoconduction in CdS Induced by Previous Illumination

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 6, pp. 1160-1168

TEXT: The fact is already known that photoconductivity may be produced in CdS single crystals at low temperatures (77°K) by infrared light of wavelengths up to 6 μ. The authors investigated the kinetics of this conduction in crystals into which impurities were not purposely introduced. In this connection it is assumed that the photoconductivity of CdS is caused by the fact that the light transfers electrons from α-type adhesion levels into the conduction band; the adhesion levels are assumed to be filled up with electrons, which is a consequence of previous illumination. Investigations of kinetics make it possible to acquire knowledge of the interaction between light and adhesion levels and to estimate the main parameters of the adhesion levels. The results obtained by experimental investigation of the induced impurity

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Investigation of the Kinetics of Infrared Impurity Photoconduction in CdS Induced by Previous Illumination

S/181/60/002/06/22/050
B006/B056

photoconduction in CdS are discussed in part 1. All investigations were carried out at 77°K on CdS single crystals onto which indium contacts were sputtered in vacuo. Above all, the spectral distribution of photoconductivity and the time-dependence of the photocurrent were investigated. Fig. 1 shows the spectral photocurrent distribution, recorded under various conditions; without previous illumination (Curve 1) with previous irradiation by green light, by leaving the sample in the dark for a longer period of time (Curve 2 - photoconductivity is found beginning at 3.5 μ), and under simultaneous constant irradiation with white light (Curve 3 - which produces exactly the same effect). In the latter case, distinct photocurrent extinction with a maximum at 0.9 μ could be observed. Further, the time dependence of infrared photoconductivity after previous illumination with green light of various intensities was investigated. Between the previous illumination and the beginning of infrared irradiation the sample was left in the dark for 40-60 minutes. The results are shown in Fig. 2. The photocurrent relaxation at the beginning of infrared irradiation was found to depend upon previous illumination (Curve a - high intensity, curve b - low

Investigation of the Kinetics of Infrared Impurity Photoconduction in CdS Induced by Previous Illumination

S/181/60/002/06/22/050
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intensity). In part 2 of this paper, these experimental results are analyzed on the basis of a model with one adhesion level, and the infrared photoconductivity kinetics is calculated for the case of a so-called "quasi-steady" excited state of the crystal. Fig. 3 shows the scheme of electronic transitions upon which the analysis is based. In part 3, the results obtained by experimental investigation of the kinetics of infrared photoconductivity in a quasi-steady excited state are given and the parameters of the adhesion level are determined. The dependence of the growth and drop times as well as of the steady photocurrent are shown in Figs. 4 and 5. Several particular features of infrared photocurrent relaxation in the unsteady state are discussed in part 5. Further investigations in this field are to follow. The crystals investigated were produced by O. A. Matveyev and L. V. Maslova. There are 6 figures and 11 references: 4 Soviet, 4 American, and 3 German.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN SSSR, Leningrad (Physico-technical Institute of the AS USSR, Leningrad)

SUBMITTED: October 26, 1959

Card 3/3

89297

9.4160 (1137, 1395)
9.4177

S/181/61/003/001/036/042
B102/B204

AUTHORS: Ryvkin, S. M., Paritskiy, L. G., Khansevarov, R. Yu., and Yaroshetskiy, I. D.

TITLE: Investigation of the kinetics of impurity photoconductivity for the purpose of determining the parameters of local levels

PERIODICAL: Fizika tverdogo tela, v. 3, no. 1, 1961, 252-266

TEXT: An investigation of impurity photoconductivity is not only of interest in principle, but is also of practical importance for studying the local electron states in the forbidden band and especially of its interaction with exciting radiation. Apart from an earlier paper by the authors, relaxation processes of impurity photoconductivity have hitherto not been investigated in detail; this was, however, the aim of the present voluminous paper. The authors set themselves the task of investigating theoretically the most important cases of photocurrent relaxation during excitation in the impurity region. The rules governing the kinetics of impurity photoconductivity have certain peculiar features as is shown

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here, due to which impurity photoconductivity relaxation differs essentially from that of intrinsic photoconductivity. An exact analysis of these rules shows that an experimental investigation of the kinetics of impurity photoconductivity may serve the purpose of determining various parameters of impurity centers as, e.g., the photon capture cross section, the trapping cross section for free carriers, as well as the energy position of the impurity level in the forbidden band, the concentration of centers and the degree of their completion. In part 1 of this paper, the most important rules of the kinetics of impurity photoconductivity in the excitation of carriers for one type of local centers are dealt with. This is done on the basis of an example of a semiconductor, in whose forbidden band there is a sort of local level with concentration M; these levels are assumed to be in the upper half of the band, so that they are in heat exchange with the conduction band. This semiconductor is irradiated with monochromatic light of such a wavelength that only electrons pass from the local levels onto the conduction band, and that monopolar impurity photoconductivity occurs. The equation of motion (13) $d\Delta n/dt = (m_o - \Delta n)qJ - \gamma \Delta n(N_{cM}+M-m_o+n_o+\Delta n)$

Investigation of the kinetics of...

is set up, where q is the capture cross section of an electron on the M-level for a photon; $m = m_0 - \Delta m$ is the electron concentration on the level M; γ is the recombination coefficient; J is the light intensity; $n = n_0 + \Delta n$ is the electron concentration in the conduction band; n_0 is the dark concentration of the electrons; N_{cM} is the effective state density in the conduction band; and $\Delta m = \Delta n$. The solution in the case of excitation by square light pulses is, for the case of growth (switching on of light), given by

$$\Delta n_{\text{ein}} = A \operatorname{th}(\gamma A t + B) - C, \qquad (1.6)$$

where

$$A = \sqrt{C^2 + m_0 \frac{qJ}{\gamma}}; \quad B = \frac{1}{2} \ln\left(1 + \frac{2C}{\Delta n_{\text{ein}}}\right);$$

$$C = \frac{1}{2}\left(N_{cM} + M - m_0 + n_0 + \frac{qJ}{\gamma}\right),$$

and for switching off

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$$\Delta n_{e_1} = \frac{\Delta n_{ev_1} \exp\left(-\frac{t}{\tau_{e_1}}\right)}{1 + \gamma \Delta n_{ev_1} \tau_{e_1} \left[1 - \exp\left(-\frac{t}{\tau_{e_1}}\right)\right]} \quad (1.7)$$

$$\tau_{e_1} = \frac{1}{\gamma(N_{eM} + M - m_0 + n_0)}$$

and the steady concentration of non-equilibrium carriers is given by

$$\Delta n_{st} = \Delta n_{ev_1} = \frac{N_{eM} + M - m_0 + n_0 + \frac{qJ}{\gamma}}{2} \times \left[\sqrt{1 + \frac{4m_0 qJ}{\gamma\left(N_{eM} + M - m_0 + n_0 + \frac{qJ}{\gamma}\right)^2}} - 1\right] \quad (1.8)$$

For low light intensities, $\Delta n_{st} = m_0 qJ/\gamma(N_{st} + M - m_0 + n_0)$, and for high intensities, $\Delta n_{st} \simeq m_0$. The equation of motion is solved also under

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different conditions and for different special cases, and expressions are derived for the relaxation times. The dependence of relaxation times on light intensity is investigated, and explicit formulas are derived for q. In part 2 of this paper, the effect of a constant exposure in the impurity region upon the kinetics of impurity photoconductivity is investigated. (1.3) acquires the form

$$\frac{d\Delta n}{dt} = (m_0 - n_{J_0})q\Delta J - \gamma\Delta n \times$$
$$\times\left(N_{eff} + M - m_0 + n_0 + 2n_{J_0} + \Delta n + \frac{qJ_0}{\gamma} + \frac{q\Delta J}{\gamma}\right), \qquad (2.1)$$

where J_0 is the intensity of constant exposure, ΔJ the amplitude of the square light pulse, and n_{J_0} the steady carrier concentration in the conduction band. The solutions (growth, drop, steady) have the form

$\Delta n_H = \Delta n_{st}\left[1-\exp(-t/\tau_H)\right]$; $\Delta n_c = \Delta n_{st}\exp(-t/\tau_c)$; and

Investigation of the kinetics of...

$\Delta n_{st} = (m_o - n_{J_o}) q \Delta J \tau_H$. For γ ... $\gamma = \frac{qJ_o}{\frac{n_o + n_{J_o}}{M} \frac{}{m_o - n_{J_o}} - n_o - n_{J_o} - N_{eN}}$. (2.13)

is obtained. In part 3 of this paper, the effect of constant exposure within the region of intrinsic absorption upon the relaxation of impurity photoconductivity is investigated. This is done on the basis of a simple example of "absolute adhesion levels" (levels for which the trapping cross sections for carriers of one kind vanish) for short-wave exposure of intensity I, which conveys electrons from the valence band into the conduction band; electron-hole recombination was carried out over the level S. Here, the most simple case of monopolar electronic intrinsic photoconductivity in linear recombination of free electrons is investigated. The kinetics of the electron transitions is described by the system

$$\frac{dn}{dt} = \beta k J - \gamma n (M - m) + \gamma m N_{eN} + qmJ - \frac{n}{\tau}, \quad (3.1)$$

$$\frac{dm}{dt} = \gamma n (M - m) - \gamma m N_{eN} - qmJ, \quad (3.2)$$

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where β is the quantum yield of the intrinsic effect, k the absorption coefficient in the intrinsic region, whose solution for switching in long-wave light is given by

$$\Delta n = \frac{q m_0 \Delta f \left(\frac{1}{\tau_N} + q\Delta f + r_1\right)\left(\frac{1}{\tau_N} + q\Delta f + r_2\right)}{\frac{1}{\tau_N}\left(\frac{1}{\tau_N} + q\Delta f\right)(r_1 - r_2)} [\exp(r_1 t) - \exp(r_2 t)], \quad (3.9)$$

where

$$r_{1,2} = -\frac{1}{2}\left(\frac{1}{\tau} + \frac{1}{\tau_N} + \frac{1}{\tau_N} + q\Delta f\right) \pm$$

$$\pm \sqrt{\frac{1}{4}\left(\frac{1}{\tau} + \frac{1}{\tau_N} + \frac{1}{\tau_N} + q\Delta f\right)^2 - \left(\frac{1}{\tau_N} + \frac{q\Delta f}{\tau_N}\right)}.$$

and for switching off long-wave light by

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$$\Delta n = \frac{q m_0 \Delta J \left(r_1 + \frac{1}{\tau_N}\right)\left(r_2 + \frac{1}{\tau_N}\right)}{(r_1 - r_2)\left(\frac{1}{\tau_N} + q\Delta J\right)} [\exp(r_1 t) - \exp(r_2 t)], \qquad (3.10)$$

$$r_{1,2} = -\frac{1}{2}\left(\frac{1}{\tau} + \frac{1}{\tau_N} + \frac{1}{\tau_M}\right) \pm \sqrt{\frac{1}{4}\left(\frac{1}{\tau} + \frac{1}{\tau_N} + \frac{1}{\tau_M}\right)^2 - \frac{1}{\tau\tau_N}}.$$

The course of the relaxation curves is discussed in detail. The authors thank Yu. A. Zibuts for help in calculations. There are 11 figures and 8 references: 5 Soviet-bloc and 3 non-Soviet-bloc.

ASSOCIATION: Leningradskiy fiziko-tekhnicheskiy institut AN SSSR imeni akad. A. F. Ioffe (Leningrad Institute of Physics and Technology of the AS USSR imeni Academician A. F. Ioffe)

SUBMITTED: July 16, 1960

Card 8/8

37932

S/181/62/004/005/021/055
B125/B108

9,4177

AUTHORS: Mekhtiyev, R. F., and Paritskiy, L. G.

TITLE: Kinetics of the photoconduction in GaSe

PERIODICAL: Fizika tverdogo tela, v. 4, no. 5, 1962, 1222-1226

TEXT: The kinetics of the photocurrent in p-type GaSe single crystals (resistivity 25 ohm·cm) is examined. The relaxation curves have a "slow" component with the time constant ~40 sec and a "fast" component with a characteristic time of several milliseconds. With increasing light intensity, the slow component increases non-linearly and attains saturation: the fast component increases approximately linearly. An additional constant illumination of the crystal causes the slow amplitude to decrease to zero with increasing intensity of irradiation. The time constant of the slow component depends on the thermal ejection into the conduction band and on the recombination with the equilibrium holes of the valence band. At low temperatures, the time constant depends on recombination only. The thermal ejections prevail at high temperatures.

The concentration of the electron trapping levels (M) amounts to

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$(1-4)\cdot10^{13}$ cm^{-3}. The capture coefficient of an electron or hole (to an M level) amounts to $\gamma = 4\cdot10^{-16} cm^3/sec$ ($\sigma_n = 4\cdot10^{-23}$ cm^2) and $=1.5\cdot10^{-18}$ cm^3/sec ($\sigma_p = 1.5\cdot10^{-25} cm^2$), respectively. The "fast" component consists of several "subcomponents". This structure causes, apparently, some trapping levels for electrons. The "fastest" component of photoconductivity does not depend on illuminance. There are 5 figures. The most important English-language reference is: P. Fielding, G. Fisher a. E. Mooser. J. Phys. Chem., Sol., 8,434, 1959.

ASSOCIATION: Institut fiziki AN Az SSR, Baku (Physics Institute of the AS Azerbaydzhan SSR, Baku); Fiziko-tekhnicheskiy institut im. A. F. Ioffe AN SSSR, Leningrad (Physicotechnical Institute imeni A. F. Ioffe AS USSR, Leningrad)

SUBMITTED: December 26, 1961

PARITSKIY, L. G.

Class 21e, 36. No.102495. L. G. Paritskiy and A. D. Logushkov. Method of Measuring Time Constant of Capacitor by the Method of Self-Charge.

Certificates of Invention (USSR State Patents) Elektrosvyaz', No. 7, 1956.

81369
S/181/60/002/03/28/028
B006/B017

24.7700

AUTHORS: Paritskiy, L. G., Ryvkin, S. M.

TITLE: The Influence of Adhesion Levels on the Relaxation of Photoconductivity in CdS Single Crystals

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 3, pp. 547-557

TEXT: The aim of the present paper was to investigate experimentally the initial stages of the increase of photoconductivity in CdS single crystals during some ten microseconds. As has been demonstrated by V. Ye. Lashkarev et al. in several papers, the characteristic features of photoconductivity in these crystals may be explained by the complex two-stage character of electron excitation in the conduction band. Here, the quantum yield depends on the excitation level. Other authors explained these characteristic features of photoconductivity by the complex character of recombination processes, which leads to a change in lifetime. Here, the quantum yield is constant and equal to unity. Hence, an explanation of the actual mechanism of the photoeffect in CdS can be

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The Influence of Adhesion Levels on the Relaxation of Photoconductivity in CdS Single Crystals

obtained by investigating the "true" quantum yield of the photocurrent in CdS as dependent on the excitation level. The initial stages of the increase of the photocurrent were examined by means of an instrument schematically represented in Fig. 1. The instrument and the measuring technique are described. Fig. 2 shows the shape of the photocurrent curves during the first 50 msec for various irradiation intensities. The higher the intensity, the steeper the rise of the curves and the higher the relative yield. Fig. 3 shows a typical oscillogram for one of the samples. Fig. 4 shows the growth of a curve with a pulse duration of 10 μsec. It indicates that the steep rise takes place during the first microseconds. Hence, rapid processes proceed at the first stages of formation of the photocurrent. The results obtained in the experiments concerning the characteristic features of photocurrent relaxation can be explained in the simplest way by assuming the capture of carriers by a-type adhesion levels. Since the lifetime of the conduction electrons with respect to their adhesion levels is much shorter than with respect to their recombination, the adhesion levels are first filled up within a very

The Influence of Adhesion Levels on the Relaxation of Photoconductivity in CdS Single Crystals

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B006/B017

short time, and only then the slow establishment of recombination equilibrium starts. This is theoretically investigated in the following. Fig. 5 shows the dependence of the concentration of free electrons on t/θ_{min} for different adhesion level densities. The higher the level density, the flatter the rise of n. In the following, the influence exercised by constant exposure on the first stages of the increase of photoconductivity is investigated. The existence of rapid capturing processes influences the change of photoconductivity in time and, especially, the phenomenological yield and the effective lifetime of non-equilibrium carriers. Also the character of the dependence of these quantities on constant irradiation and its intensity is considerably influenced by these processes. Hence, the characteristic features of photoconductivity of CdS are rather to be connected with the complex character of recombination processes than with the excitation process. In an appendix, the influence exercised by constant exposure on the relaxation of monopolar photoconductivity in the presence of a) α-type and b) β-type adhesion levels is investigated. A. B. Berezin, O. A.

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The Influence of Adhesion Levels on the Relaxation of Photoconductivity in CdS Single Crystals

S/181/60/002/03/28/028
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Matveyev, L. V. Maslova, and G. A. Fedorus are mentioned. There are 12 figures and 17 references: 8 Soviet, 6 US, and 2 German.

ASSOCIATION: Fiziko-tekhnicheskiy institut AN SSSR Leningrad (Institute of Physics and Technology of the AS USSR, Leningrad)

SUBMITTED: June 14, 1959

Card 4/4

PARITSKIY L.G.

RYVKIN, S.M.; PARITSKIY, L.G.

Certain characteristics of photocurrents in cadmium sulfide monocrystals. Zhur.tekh.fiz. 24 no.1:3-17 Ja '54. (MLRA 7:2)
(Photoelectricity) (Cadmium sulfide)

RYVKIN, S.M.; PARITSKIY, L.G.; KHANSEVAROV, R.Yu.; YAROSHETSKIY, I.D.

Investigating the kinetics of extrinsic photoconductivity as a method for the determination of local level parameters. Fiz. tver. tela 3 no.1:252-266 Ja '61. (MIRA 14:3)

1. Leningradskiy fiziko-tekhnicheskiy institut AN SSSR imeni akad. A.F. Ioffe.

(Photoconductivity)

L 01826-67 EWT(l)/EWT(m)/EWP(w)/T/EWP(t)/ETI IJP(c) JD/JG/AT

ACC NR: AP6030951 SOURCE CODE: UR/0181/66/008/009/2549/2557

AUTHOR: Zibuts, Yu. A.; Paritskiy, L. G.; Ryvkin, S. M.; Dokholyan, Zh. G.

ORG: Physicotechnical Institute im. Ioffe AN SSSR, Leningrad (Fiziko-tekhnicheskiy institut AN SSSR)

TITLE: Photoelectric properties of silicon with copper, molybdenum, and platinum impurities

SOURCE: Fizika tverdogo tela, v. 8, no. 9, 1966, 2549-2557

TOPIC TAGS: semiconductor, silicon semiconductor, photoelectric property, silicon semiconductor impurity, semiconductor impurity, photoconductivity, relaxation, carrier capture, electron capture, photon capture, impurity center, excitation

ABSTRACT: An investigation is made of the spectra and kinetics of impurity photoconductivity of silicon doped with copper, molybdenum, and platinum. The effective cross-sections of electron and photon capture at the copper and molybdenum levels were determined. The characteristics of photoconductivity relaxation in Si(W) samples were analyzed and explained. Samples of Si(Pt) were used to study the laws

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Card 2/2 fv

L 05625-67 EWT(1)/T IJP(c) AT

ACC NR: AP6024497 SOURCE CODE: UR/0181/66/008/007/2240/2242

48
46
B

AUTHOR: Yevstropov, V. V.; Zibuts, Yu. A.; Paritskiy, L. G.

ORG: Physicotechnical Institute im. A. F. Ioffe, AN SSSR, Leningrad (Fiziko-tekhnicheskiy institut AN SSSR)

TITLE: Occurrence of photo emf in a homogeneous semiconductor on the separation boundary between regions of different degrees of optic ionization of the impurities

SOURCE: Fizika tverdogo tela, v. 8, no. 7, 1966, 2240-2242

TOPIC TAGS: photo emf, semiconductor impurity, ionization, impurity level

ABSTRACT: Since normally the production of a photo emf calls for the presence of inhomogeneities in the semiconductor, the authors show that under certain conditions it is possible to produce a photo emf in a perfectly homogeneous semiconductor by illuminating it with two beams of light having different spectral compositions. In one region the energy of the light should be sufficient only for ionization of the shallow levels, and in the other, the quantum energy should be sufficient for formation of electron-hole pairs. Occurrence of photo emf is essentially due to an impurity-ionization gradient produced by uneven illumination in the spectral region of impurity absorption. The magnitude of the photo emf is calculated and it is shown that it is of the same order of magnitude as the volume emf, and can reach tens of millivolts under favorable conditions. Measurements on p-type germanium doped with gold, using a beam of infrared light, confirmed the calculations. The authors thank S. M. Ryvkin,

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L 05625-67

ACC NR: AP6024497

2

A. A. Grinberg, and F. M. Berkovskiy for useful discussions. Orig. art. has: 2 figures and 1 formula.

SUB CODE: 20/ SUBM DATE: 25Dec65/ ORIG REF: 002/ OTH REF: 004

Card 2/2 egh

L 08128-67 EWT(1) IJP(c) AT

ACC NR: AP6033577 SOURCE CODE: UR/0181/66/008/010/3090/3092

AUTHOR: Mirdzhalilova, M. A.; Paritskiy, L. G.

ORG: Physicotechnical Institute im. A. F. Ioffe, AN SSSR, Leningrad (Fiziko-tekhnicheskiy institut AN SSSR) 32 B

TITLE: Thermally stimulated emf on the electron-hole junction

SOURCE: Fizika tverdogo tela, v. 8, no. 10, 3090-3092

TOPIC TAGS: pn junction, semiconductivity, junction diode, thermoelectricity

ABSTRACT: Experiments are described in which thermally stimulated emf and current were measured in a shallow p-n junction in which the p-region contained electron trapping levels in the form of local M centers. During illumination of the p-region or passage of a forward current, the injected electrons fill the M traps and remain in the bound state as long as the temperature is sufficiently low. When the temperature is increased smoothly, the electrons leave the traps and drift into the n-region, creating a current which decreases as the traps empty. Measurements were performed on silicon diodes and photodiodes and germanium diodes. At nitrogen temperatures, a forward current was first passed through the samples for ten minutes, and then, while the back current was being applied, the samples were heated at 0.25°/sec. Energy level evaluations were performed by using the formula for the energy of the traps with respect to the conductivity band. It is suggested that the procedure

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